

[0048]

Claims

- 1 A vibration-reducing system for use with a data processing apparatus, the data processing apparatus having a body and a data access apparatus coupled to the body, the body having a depression for containing the data access apparatus, the vibration-reducing system comprising:

at least one first elastic element having flexibility both in bending and in vertical extension, a first end of the first elastic element connecting with the data access apparatus, and a second end of the first elastic element connecting with the body, wherein the data access apparatus is suspended within the depression by using the first elastic element;

at least one second elastic element having flexibility in vertical compression, the second elastic element having an elastic modulus smaller than the elastic modulus of the first elastic element, the second elastic element being disposed between the body and the data access apparatus, the second elastic element including a first surface connecting with the body and a second surface opposite to the first surface and contacting with the data access

apparatus;

wherein while the body is impacted to generate an initial energy and a displacement, the data access apparatus stretches or bends the first elastic element and compresses the second elastic element, then a damping effect generated by a difference between the elastic modulus of the first and the second elastic elements helps to remove a part of the initial energy from the data access apparatus.

- 2 The vibration-reducing system of claim 1, wherein the damping effect includes:

while the data access apparatus stretches or bends the first elastic element and compresses the second elastic element, a part of the initial energy is transmitted to the first elastic element as a first potential energy, and another part of the initial energy is transmitted to the second elastic element as a second potential energy;

the first potential energy provides the data access apparatus with a rebound speed, the rebound speed exceeds a returning speed of the second elastic element to separate the second surface from the data access apparatus and to prevent the second potential energy from transmitting back to the data access

apparatus.

- 3 The vibration-reducing system of claim 1, wherein the body includes a frame contained within the depression and coupled to an inner surface of the depression, the data access apparatus connects with the frame by using the first elastic element, the second elastic element is disposed between the frame and the data access apparatus and the first surface connects to the frame.
- 4 The vibration-reducing system of claim 1, further comprising at least one vibration absorbing spacer disposed between the first elastic element and data access apparatus.
- 5 The vibration-reducing system of claim 1, wherein the body includes a cover corresponding to the depression for covering the data access apparatus, at least one second elastic element is disposed between the cover and the data access apparatus, the first surface of the second elastic element connects to an inner surface of the cover, and the second surface of the second elastic element contacts with the data access apparatus.
- 6 The vibration-reducing system of claim 1, wherein the first elastic element includes a spring.
- 7 The vibration-reducing system of claim 1, wherein

the first elastic element includes an elastic rubber.

8 The vibration-reducing system of claim 1, wherein the second elastic element includes a vibration-absorptive material.

9 The vibration-reducing system of claim 8, wherein the vibration-absorptive material includes a polymer.

10 The vibration-reducing system of claim 1, wherein the data access apparatus includes a hard disk.

11 The vibration-reducing system of claim 1, wherein the data processing apparatus includes a portable computer.

12 A method for reducing vibration generated on a data access apparatus of a data processing apparatus by removing an initial energy of the data access apparatus, the method comprising:

(a) moving the data access apparatus with a displacement corresponding to the initial energy;

(b) stretching or bending a first elastic element and compressing a second elastic element by the data access apparatus corresponding to the displacement, wherein the elastic modulus of the second elastic element is smaller than the elastic modulus of the first elastic element;

(c) generating a damping effect by a difference between the elastic modulus of the first and the second elastic elements to remove a part of the initial energy from the data access apparatus.

- 13 The method of claim 12, wherein the step (C) further includes:

transmitting a part of the initial energy to the first elastic element as a first potential energy, and transmitting another part of the initial energy to the second elastic element as a second potential energy;

transmitting the first potential energy to the data access apparatus as a rebound energy and providing the data access apparatus with a rebound speed by the rebound energy, wherein the rebound speed exceeds a returning speed of the second elastic element; and

separating the data access apparatus from the second elastic element by using the rebound speed to prevent the second potential energy from transmitting back to the data access apparatus.

- 14 The method of claim 12, wherein the first elastic element includes a spring.

- 15 The method of claim 12, wherein the first elastic
element includes an elastic rubber.
- 16 The method of claim 12, wherein the second elastic
element includes a vibration-absorptive material.
- 17 The method of claim 16, wherein the
vibration-absorptive material includes a polymer.
- 18 The method of claim 12, wherein the data access
apparatus includes a hard disk.
- 19 The method of claim 12, wherein the data processing
apparatus includes a portable computer.